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California Air Resources Board
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Subject: LCFS Reconsideration: CA-GREET Model Update

Dear Members of the California Air Resources Board:

Thank you for the opportunity to provide feedback regarding the Air Resource Board's August 22, 2014 Workshop (Workshop) and submit comments pertaining to the preliminary CA-GREET Model Update.

The Coalition for Renewable Natural Gas is the non-profit organization representing the renewable natural gas industry. We are an association of more than fifty leading companies who operate at the various stages of the biomethane supply chain from source to end-use.

We understand that the Workshop was intended as a preliminary presentation of potential changes to the CA-GREET Model. We also acknowledge that work on a final CA-GREET 2.0 Model is ongoing and will be a lengthy process; a point made clear during follow-up meetings with ARB Staff. As such these comments are intended as a preliminary response to the information presented to date.

**First and foremost, we strongly recommend that the ARB make changes to the CA-GREET Model *only* when it is clear that such changes will result in better, more accurate modeling and strengthen the overall LCFS Program.** Application of inconclusive and questionable assumptions to the CA-GREET Model will result in a weakened LCFS and erode confidence in this essential program.

We view as positive and welcome an evaluation of new information that could potentially be incorporated into the CA-GREET Model. The goals of the LCFS are strengthened when adopted changes are based on robust and accurate information that fills gaps in coverage or corrects outdated data. In such cases, the CA-GREET Model will produce more accurate projections whereby greenhouse (GHG) emission-related activity can be more precisely measured.

In line with this position, we support the proposal to update the Animal-Waste biomethane pathway to reflect credit for methane-emissions-avoided. This approach as presented at the Workshop is a more accurate method of accounting for the methane emissions from lagoons, as compared to the flaring credit previously used. We believe the proposed update will result in a lowering of the related Carbon Intensity (CI) and thereby provide greater incentive for the utilization of the Animal-Waste biomethane pathway.

**However, other changes proposed by the ARB to the CA-GREET Model lack sufficient foundation and most likely would result in less accurate modeling and a weakened LCFS.**

A reliable LCFS program will best serve all stakeholders when proposed updates are based on empirical data and where proposed changes will result in significantly improved and/or more accurate emissions-related numbers.

The ARB must also be aware of and sensitive to the significant disruption to the credit market that will result as a consequence if changes are adopted without broad support and based on misinformation, rather than on veritable fact.

We believe that such ill-fated changes were among the illustrative examples presented by ARB staff as preliminary proposals during the August 22 Workshop. The comparison of natural gas (both fossil and landfill gas) CI's for Model Version 1.8b versus the CA-GREET 2.0 Model that is under consideration[1] would have a particularly adverse effect and disrupt the credit market. As proposed, the CI's for CNG and LNG would significantly increase across the board, primarily due to changed assumptions regarding methane leakage rates.

Specifically, the newly proposed Model includes a doubling of the overall system methane leakage rate, a 2% methane leakage factor attributed to landfill gas

[1] ARB LCFS Reconsideration: CA-GREET Model Update Workshop; August 22, 2014. (8/22 Workshop). Slide 9.

extraction and processing, and an increase in pipeline energy intensity (the amount of energy required to move 1 tonne of gas 1 mile) by a factor 4x greater than seen in the prior GREET model. The ARB staff noted that additional efforts to quantify and verify methane leakage rates are ongoing.

The ARB Technology Assessment Workshop on September 3, 2014 (9/3 Workshop) provided considerably more detail about the overall system methane leakage issue. The information presented at the 9/3 Workshop is highly informative and must be considered fully before any changes are made to the assumptions used for CA-GREET 2.0. Of particular note, the ARB staff discussed 1) the considerable variations in ways different studies calculate methane leakage; 2) the importance of segment, regional and California specific data; and 3) the significant volume of information that is expected soon, but is not yet available for consideration.

In short, the information provided at the 9/3 Workshop made clear that the ARB proposal to change biomethane CI in the CA-GREET Model is based on questionable data that lacks solid foundation. For this reason, we strongly oppose changes to CA-GREET Model with regard to the CI of biomethane.

**Lack of Methane Leakage Calculation Standards**

There is no standardization of methodology for calculating leakage.[2] The ARB staff correctly noted during the 9/3 Workshop that, "everyone uses different metrics," and that "looking at different metrics will impact the rate you come up with." There are many different ways to calculate leakage. The different methodologies produce a wide variation of rates. Accordingly, leakage rates are difficult to compare.[3] Even the Brandt study, which compared studies from different authors, regions and sources arrived at a range of possible national leakage rates that varied by 75%.[4] It is important to take note that Brandt's low-end rate (1.87%) is higher than the U.S. EPA's leakage rate (1.5%). [5] The stated differences make clear that there is not a consensus on the appropriate leakage rate factor to use as an assumption in CA-GREET 2.0.

**Limits on Segment Data**

Another theme of the 9/3 Workshop that is especially relevant to adoption considerations for CA-GREET 2.0 is the importance of segment, regional, and California specific data. We are appreciative of the considerable volume of research the ARB staff has undertaken in this regard. Due in large part to the ARB's hard work, it is evident that there are significant holes in the available data.

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[2] ARB Technology Assessment Workshop; September 3, 2014. (9/3 Workshop). Slide 44.
[3] 9/3 Workshop. Slide 52.
[4] 9/3 Workshop. Slide 56. Brandt et al, 2014. National leakage rate of 1.87 – 2.62%.
[5] 9/3 Workshop. Slide 55.

For example, attribution and calculation of the natural gas infrastructure segments is especially important when considering the different processes required of geologic natural gas (NG) versus renewable natural gas (RNG). Production and processing of the two are highly dissimilar. The ARB shared during the 9/3 Workshop that approximately 75% of NG production occurs with petroleum production.[6] We have requested the source document that supports this claim from ARB staff. In the interim, and in the absence of our ability to review the document and verify the purported information, we question the 75% percentage claim. The ARB staff acknowledges that they do not have answers on how to allocate methane leakage to oil versus gas in these instances. However, one thing should be very clear – that is, RNG production does NOT occur with petroleum production. RNG is extracted and produced by upgrading raw biogas from organic waste streams through the process of anaerobic digestion. Accordingly, in this segment of methane leakage attribution, it is inappropriate to use the same rate for NG and RNG. The NG production and processing segment should be removed in the calculation of the RNG rate.

**Landfill Gas Extraction and Processing Apples-to-Oranges Comparison**

There is good reason to question the 2% leakage adder being attributed by the ARB in its proposed changes to Renewable-CNG and Renewable-LNG from landfill biogas feedstock. The ARB staff should investigate further the sources used as the basis for this proposed leakage adder and consider its relevance.

We understand that the Argonne National Laboratory (ANL) Waste-to-Wheel study[7] is a key source for this number. The study says:

> *CH4 vented or leaked from equipment during AD, NG production or upgrading is a major source of GHG emissions. On the basis of several Swedish reports, Börjesson and Berglund (2006) estimate that 2% of the biogas produced is vented or leaked during these stages. This value is significantly larger than the 0.15% emission rate for conventional NG upgrading facilities, but could be attributed to differences in scale (Burnham et al., 2011). Therefore, this study assumes that 2% of the produced renewable gas is leaked. As indicated by Börjesson and Berglund (2006), more research on CH4 emissions from anaerobic digesters and small-scale NG processing facilities is warranted for a more comprehensive understanding of biogas-based pathways.*[8]

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[6] 9/3 Workshop. Slide 61.

[7] Han, Mintz & Wang. *Waste-to-Wheel Analysis of Anaerobic-Digestion-Based Renewable Natural Gas Pathways with the GREET Model*, Argon National Laboratory, Center for Transportation Research, Energy Systems Division, September 2011. (ANL Waste-to-Wheels).

[8] ANL Waste-to-Wheels, at 15-16.

Upon review, we see that the 2006 Börjesson[9] and Berglund[10] studies relied upon to reach a 2% "vented or leaked" assumption are from at least nine-year-old studies of anaerobic digestion facilities in Sweden - and not of landfill gas systems, or systems in the U.S.

Furthermore, based on the 2013 Swedish Gas Technology Report (SGR)[11], it appears that ANL arrives at a 2% methane loss from RNG processing plants that do not employ a thermal oxidizer or combust the waste gas produced.

Methane capture on farms is unregulated. As such, most unused (excess, waste or "tail") gas from these projects is vented instead of destroyed. However, as U.S. landfill gas systems are heavily regulated for emissions, all U.S. landfill gas-to-energy facilities utilize a thermal oxidizer or flare to combust and destroy unused waste gas.

Operators in the U.S. have obligations to ensure there are zero emissions or leaks. In California, like many places throughout North America, landfill system operators have leak monitoring requirements on the various system components, including but not limited to piping, values, flanges and other equipment. Leaks are extremely rare, and when they are discovered, they are repaired quickly. Given the level of landfill regulation in the U.S. it is very unlikely that a landfill gas system is losing 2% of methane via leaks.

We do not question ANL, Börjesson, Berglund, or SGR as a credible sources, but we do question the relevance of and weight given to these studies and strongly suggest that it is inappropriate to apply a 2% methane leakage rate rooted in a different production and processing system (biogas AD) from a different country (Sweden) with different regulations, to landfill gas operations in the United States. We continue to review these studies, but our early analysis leads us to conclude that the calculation application is not appropriate.

We are not aware of any data that supports the idea that processing of RNG at a landfill will lead to greater methane emissions compared to combusting the same methane in a flare or thermal oxidizer – both of which are very efficient combustion devices.

Moreover, and perhaps most critical, the ARB must consider the fact that RNG producers frequently invest in methane capture at landfills that greatly exceeds the rate of methane capture that would occur in the absence of the project. In fact, RNG

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[9] Börjesson, P., Berglund, M., 2006. Environmental systems analysis of biogas systems—Part I: Fuel-cycle emissions. Biomass and Bioenergy 30, 469–485.

[10] Berglund, M., Börjesson, P., 2006. Assessment of energy performance in the life-cycle of biogas production. Biomass and Bioenergy 30, 254–266.

[11] Bauer, F., Hulteberg, C., Persson, T., Tamm, D., 2013. Swedish Gas Technology Centre Rapport. Description of the available upgrading technologies. Membrane separation, 28-31.

projects at landfills typically have a far greater density of wells with more tightly controlled vacuum applied to those wells, than other types of energy projects at landfills. Many of our member companies have invested millions of dollars in wells and gas collection infrastructure at their projects to capture methane from sections of the landfill that have not yet triggered the gas collection requirements of the U.S. EPA New Source Performance Standards (NSPS). The assumption that all of the methane captured at a landfill and processed into RNG would have been destroyed in the flare absent the RNG production process is inaccurate. Under federal regulations, a major section of a landfill can be operated without a landfill gas collection system for as up to five years from the date that waste is first deposited at the landfill before installation of a gas collection system is required. In the absence of an RNG production project or facility, significant quantities of the methane produced at the landfill will vent into the atmosphere from the areas of the landfill that are not yet regulated. The production and sale of RNG provides the economic incentive to capture as many molecules of methane from the landfill as possible, and also provides the revenue stream necessary to pay for the additional gas collection system improvements needed to make increased methane capture possible. If the ARB is going to adjust the RNG from Landfill Gas Pathway, this "early well installation" and methane capture and destruction must also be taken into account in determining the CI of the biomethane.

**Limits on Regional Data**

California receives the majority of its geologic natural gas from four key basins - each which utilize different pipeline systems.[12] As such, a national average methane leakage rate is expedient and offers some value for gas that is transported inter-state. However, a national average may not accurately reflect real methane leakage rates for methane that is produced in California and transported intra-state using only California's pipeline systems. Defaulting to a national leakage rate for California is akin to saying that all major league baseball players have a .260 batting average. It may provide a shorthand method to understand the overall batting percentage for the average player, but it fails to differentiate between individual players or distinguish the vast difference between the great hitters and poor hitters. We recognize that obtaining methane leakage rates from each pipeline system in order to formulate accurate regional averages could prove to be practically impossible, particularly in certain regions. As such, and so as to not disadvantage producers from those regions, we suggest that the ARB work with each producer on a case-by-case basis and allow producers to supply available regional data as evidence to demonstrate a lower methane leakage rate than the national average during their pathway approval process.

[12] 9/3 Workshop. Slide 42. Sourced from CEC, Energy Almanac 2014.

**Limits on California Data**

CA-GREET 2.0 should use California specific leakage rates for gas originating in California. The California rate should be grounded in state-specific data relative to California's natural gas infrastructure (including transmission, storage and distribution). California is a leader in environmental protection. Our statutes and regulations are among the most stringent in the country – and the pipeline systems that transport the majority of the natural gas used in California are among the newest. It follows that California's leakage rates are lower than the national average. Still, we agree that more California data is needed to make this determination and appropriately attribute leakage to the various segments and systems within the state.

**More Studies, Legislation on the Horizon**

We are encouraged that the ARB staff notes more than twenty (20) ongoing studies related to methane leakage, including four studies by the California Energy Commission (CEC), sixteen by the Environmental Defense Fund (EDF), and a national Gas Technology Institute (GTI) study that ARB is supplementing with California specific measurements.[13]

Additionally, the California Legislature just passed SB 1371 (Leno). If Governor Brown signs the bill into law, the Public Utilities Commission (CPUC) will open a proceeding to adopt rules and procedures to monitor, repair and minimize methane leaks from natural gas pipelines regulated by the CPUC.[14]

The bottom line is that additional, pertinent information is coming soon and we should not act precipitously by adopting changes based on incomplete data and flawed assumptions.

**Adoption of New Methane Leakage Rates is Premature**

A number of related issues remain unresolved given the limited data currently available. Using a national methane leakage rate for all natural gas (geologic and renewable) is too simplistic and results in an unfair program that dismisses California's gains in environmental regulations and industry's adherence to these regulations. Furthermore, applying a 2% leakage rate to landfill-gas-derived Renewable-CNG and Renewable-LNG is inappropriate since it is based on an apples (biomethane)-to-oranges (natural gas) comparison, is inconsistent with the actual operations of RNG production facilities at landfills, excludes the carbon benefits of early well installation and the capture and destruction of "unregulated methane" at the same sites.

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[13] 9/3 Workshop. Slide 69.

[14] Senate Bill 1371 (Leno), Enrolled 8/29/14. Senate Floor Analysis, 8/27/14.

Changing the CA-GREET Model to include new methane leakage rates will not result in more accurate projections. The preliminary indication is that proposed changes to the CA-GREET Model will result in higher CI's for CNG, LNG and their renewable counterparts.[15] If adopted, this upward adjustment will have a chilling impact on the market and reduce the economic incentive for production of low-carbon fuels. Assessing higher CI's will reduce the number of LCFS credits generated from RNG vehicle fuel projects and thereby slow NG and RNG adoption. Furthermore, given the serious and potentially negative impact on the renewable fuels industry, changing the value basis for these low carbon fuels without compelling reasons or valid scientific basis will signal to investors that they cannot count on market stability.

We urge the ARB to take a preferred course of action and delay implementing any new methane leakage rates. The ARB should continue to gather additional data on RNG production before applying any new assumptions regarding methane leakage or the CI of RNG. We would be pleased to coordinate with our members to support the ARB in this process and supply actual production data from our members' respective RNG projects.

The ARB should continue its good work to better understand the regional and segmented differences between the natural gas systems. With new data on the horizon, and an updated GREET.net soon to be available, the ARB will be in a far better position to evaluate and adopt more accurate leakage rates at a later date once updated information has been reviewed - and once the pressure of a fast-approaching deadline to re-adopt an improved LCFS has passed.

**Conclusion**

We share the ARB's goal of a stronger LCFS. We believe this goal is best achieved by an LCFS that is credible, stable and predictable. A strong LCFS is rooted in good data and takes note that changes, particularly those with significant market impacts, must be made based on compelling evidence and complete information. In the case of methane leakage attributable to natural gas systems and processing of RNG, the evidence is lacking

Thank you for the opportunity to provide feedback on the August 22, 2014 Workshop on the CA-GREET Model Update. We look forward to continued engagement with the Board and ARB Staff on these matters.

[15] 8/22 Workshop. Slide 9.

Sincerely,

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